

PATENT ABSTRACTS OF JAPAN

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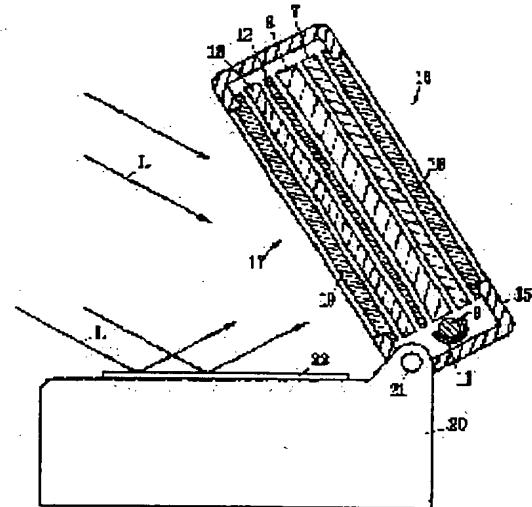
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(54) LIQUID CRYSTAL DISPLAY DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To utilize external light for illumination of a liquid crystal element and to shield light of a light source leaking backward with simple operation by providing a light shielding liquid crystal element provided in the rear of a translucent member and capable of switching a transmission state transmitting the external light to a shield state shielding the external light.

SOLUTION: This device is provided with a displaying liquid crystal element 7, a light transmission body 8, the light source 9 and the translucent member 12. The shielding liquid crystal element 13, capable of switching the transmission state transmitting the external light to the shield state shielding the external light, provided in the rear of the translucent member 12. Then, when the external light is obtained sufficiently, the shielding liquid crystal element 13 is brought into the transmission state, and the light source 9 is turned off. Further, when the external light L is not obtained sufficiently such as night, etc., the shielding liquid crystal element 13 is brought into the shield state, and the light source 9 is turned on. Although a part of the light of the light source 9 transmits through the translucent member 12, it is shielded by the shielding liquid crystal element 13 not to be leaked backward.



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**Japanese Unexamined Patent Publication
No. 265069/1997 (Tokukaihei 9-265069)**

A. Relevance of the Above-identified Document

The following is a partial English translation of exemplary portions of non-English language information that may be relevant to the issue of patentability of the claims of the present application.

B. Translation of the Relevant Passages of the Document

See also the attached English Abstract.

[Claim 1]

.... a light-shielding-use liquid crystal element whose status is switched between (i) a transmissive status in which external light is transmitted and (ii) a light-shielding status in which the external light is blocked;....

[0003]

.... The present invention is for providing a liquid crystal display device in which (i) external light can be used for illuminating a liquid crystal element, and (ii) light of a light source is kept from leaking from the backside, with a simple operation.

[0004]

.... a light-shielding-use liquid crystal element whose status is switched between (i) a transmissive status in which external light is transmitted and (ii) a light-shielding status in which the external light is blocked;.....

[0007]

With the provision of the light-shielding-use liquid crystal element 13 whose status can be switched between (i) the transmissive status in which the external light L is transmitted and (ii) the light-shielding status in which the external light L is blocked, it is possible to (i) use the external light L for illuminating a liquid crystal element 7, and (ii) prevent light of the light source 9 from leaking from the backside, with a simple operation.

[0011]

The reference numeral 7 indicates a display-use liquid crystal element. This display-use liquid crystal element 7 is so-called dot-matrix type, in which pixels 7a are arranged in a matrix-manner, and is capable of displaying various characters or figures by switching desirable pixels 7a to a transmissive status or a non-transmissive status. The reference numeral 8 indicates a light-guiding body. This light-guiding body 8 is a plate-like member which is

made of translucent resin such as acryl. The light-guiding body 8 is provided at the back side of the display-use liquid crystal element 7. The reference numeral 9 indicates a cold-cathode tube (light source) which is turned on by switching a switch 10 to the on state. This cold-cathode tube 9 is arranged along a side face of the light-guiding body 8, and supplies light to the light-guiding body 8. The reference numeral 11 indicates a reflector for reflecting the light from the cold-cathode tube towards the side of the light-guiding body 8. The reference numeral 12 indicates a semi-transmissive plate (semi-transmissive member) which is a sheet-like member, made of a resin such as polycarbonate. The semi-transmissive plate 12 is provided at the back side of the light-guiding body 8. The reference numeral 13 indicates a light-shielding-use liquid crystal element which is a TN type liquid crystal element in which a TN (Twisted Nematic) type liquid crystal is sandwiched between a pair of glass substrates. A segment 13a of this light-shielding-use liquid crystal element 13 can be switched to the transmissive status or to the light-shielding status, by switching the switch 14 to the off or the on state. Note that the segment 13a is made slightly larger than the light-inlet window, as described later.

[0013]

While there is sufficient amount of the external light L, the switches 10 and 14 are switched to the off state, so that the light-shielding-use liquid crystal element 13 is switched to the transmissive status, and that the cold-cathode tube 9 is turned off. The external light L directly enters from the light-inlet window 17, or is reflected from a reflecting mirror 22 and enters the light-inlet window 17. Then, the external light L is transmitted through the light-shielding-use liquid crystal element 13, and reaches the display-use liquid crystal element 7 from the back side of the display-use liquid crystal element 7. Further, in a case where the external light L is not enough (e.g. a night time or the like), the switches 10 and 14 are switched to the on state, so that the light-shielding-use liquid crystal element 13 is switched to the light-shielding status, and that the cold-cathode tube 9 is turned on. The light from the cold-cathode tube 9 is reflected diffusely within the light-guiding body 8, and is reflected towards the front side by the semi-transmissive plate 12, and reaches to the display-use liquid crystal element 7. Although the light from the cold-cathode tube 9 is partially transmitted through the semi-transmissive plate 12, the transmitted light is blocked by the light-shielding-use liquid crystal element 13, and will not leak from the backside.

[0014]

With the present embodiment, it is possible to use the external light L or the light from the cold-cathode tube as the illumination, by switching between the external light L and the light from the cold-cathode tube. Further, simply by switching the switch 14 to the on state, the light-shielding-use liquid crystal element 13 is switched to the light-shielding status which prevents the light of the cold-cathode tube 9 from leaking from the back side.

[0016]

Further, the present embodiment is such that the external light L or the light from the cold-cathode tube 9 is used as the illumination, by switching between the external light L and the light from the cold-cathode tube. However, the cold-cathode tube may be turned on, in the case where a sufficient amount of the external light L is available, so that the display-use liquid crystal element 9 can be more brightly illuminated. Here, even if the light of the cold-cathode tube leaks from the backside, the leakage will not cause a problem, because the surrounding light is bright.

(3)

スラット・ネマティク) 型液晶を封入したTNT型液晶系³子である。遮光用液晶系子¹³はスイッチ¹⁴をOFFまたはONにすることによりセグメント^{13a}を透過状態と遮光状態とに切換えることができる。なお、セグメント^{13a}は後述する採光部よりも若干大きくなっている。

【0012】15はケースであり、表示用液晶系子⁷、導光体⁸、冷陰極管⁹、リフレクタ¹¹、半透過板¹²及び遮光用液晶系子¹³を収納する。16は表示窓であり、この表示窓¹⁶は表示用液晶系子⁷に対応して形成された開口である。表示窓¹⁶は表示用液晶系子⁷の前面側に形成される。17は表示窓¹⁶と、この表示窓¹⁶はケース¹⁵の後面側に形成された開口である。表示窓¹⁶は遮光用液晶系子¹³に対応して形成される。また、表示窓¹⁶は採光窓¹⁷には次々透明パネル¹⁸が嵌め込まれている。20は台座であり、ケース¹⁵に回転可能に嵌けられ、表示用液晶系子⁷を所望の角度に調節できる。22は反射鏡(反射部材)であり、太陽光、室内照明光等の外部光を採光窓¹⁷側に反射させることができる。反射鏡²²は台座²⁰の上面に接着され設置される。

【0013】14が次々とONに得られる場合は、スイッチ¹⁰をONにして、遮光用液晶系子¹³を透過状態にし、冷陰極管⁹を点灯する。外部光⁸は直接また、反射鏡²²に反射され採光窓¹⁷から入射し、遮光用液晶系子¹³を透過して表示用液晶系子⁷の後方から照射される。また、放電管⁹の外部光が十分に得られない場合は、スイッチ¹⁰、¹⁴を次々ONにして、遮光用液晶系子¹³を遮光状態にして、冷陰極管⁹を点灯させる。冷陰極管⁹の光は遮光部¹³の内部を乱反射しながら半透過板¹²により前方に反射され、表示用液晶系子⁷に照射される。また、冷陰極管⁹の光の一部は半透過板¹²を透過して表示用液晶系子⁷の後方から照射される。

【0014】本実施例によれば、外部光⁸と冷陰極管⁹の光を切換えて表示用液晶系子⁷の照明に利用することができる。また、スイッチ¹⁴をONにする簡単な操作により、台座²⁰に外部光⁸を採光窓¹⁷側に反射する反射鏡²²を設けることにより、表示用液晶系子⁷に照射される外部光⁸を増加させることができる。

【0015】なお、本実施例の遮光用液晶系子¹³はスイッチ¹⁴がONの時に遮光状態となるものであるが、遮光用液晶系子¹³は、例えはスイッチ¹⁴がOFFの時に遮光状態で、スイッチ¹⁴がONの時に透過状態となるものであってよい。また、遮光用液晶系子¹³はTNT型液晶系子であるが、例えは液晶をマイクロカプセル化した状態で高分子マトリックスに分散させたNCA型液晶系子で

あっても良い。

【0016】また、本実施例は、外部光⁸と冷陰極管⁹の光とを切換えて表示用液晶系子⁷の照明に利用するものであるが、外部光⁸しか十分に得られる場合にも冷陰極管⁹を点灯させても良く、表示用液晶系子⁹を一層明るく照射することができる。このとき、冷陰極管⁹の光が後方に漏れても、周囲が明るいため問題が生じない。

【0017】また、本実施例のスイッチ¹⁰、¹⁴は夫々個別に操作するものであるが、リレー回路等を用いて1個のスイッチで遮光用液晶系子¹³と光路⁹を運動して操作できるようにも良い。

【0018】また、本実施例は半透過板¹²を用いたものであるが、例えは導光体⁸の後面に半透過性のインクを印刷する半透過層(半透過部材)を設けても良い。

【0019】【発明の効果】本発明は、表示用液晶系子と、前記表示用液晶系子の後方に設けられた導光体と、前記導光体に光を供給する光路と、前記導光体の後方に設けられた半透過部材と、前記半透過部材の後方に設けられた外部光を透過させる透過状態と前記外部光を遮る遮光状態とに切替可能な遮光用液晶系子と、を有するものであり、表示用液晶系子の照明に外部光を利用することができる、且つ簡単な操作で後方に漏れる光源の光を遮ることができる。

【0020】また、本発明は、前記表示用液晶系子と前記導光体と前記光路と前記半透過部材と前記遮光用液晶系子とを観察し前記遮光用液晶系子に対応した投光部が設けられたケースと、前記ケースに回動可能に設けられた台座と、を有するものであり、表示用液晶系子⁷を所望の角度に調整することができる。

【0021】また、本発明は、前記台座に設けられた反射鏡を前記遮光部側に反射させる反射部材を有するものであり、表示用液晶系子⁷に照射される外部光⁸を増加させることができる。

【図面の簡単な説明】

【図1】本発明の実施例を示す部分断面図。

【図2】同上実施例を示す分解斜視図。

【図3】従来例を示す断面図。

【符号の説明】

1 表示用液晶系子

2 导光体

3 冷陰極管(光源)

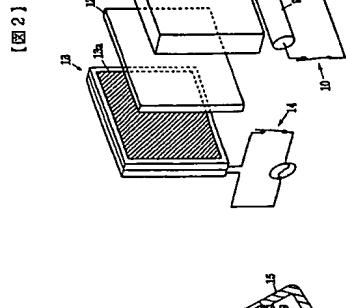
4 半透過板(半透過部材)

5 遮光用液晶系子

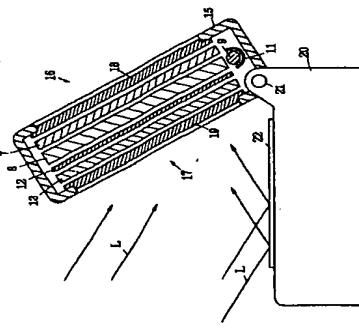
6 台座

7 反射鏡(反射部材)

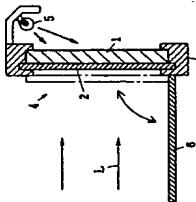
【図1】



【図2】

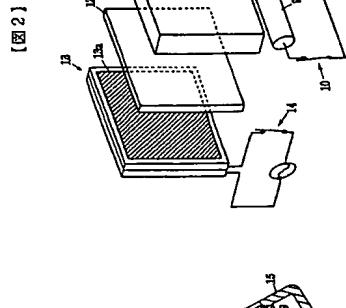


【図3】

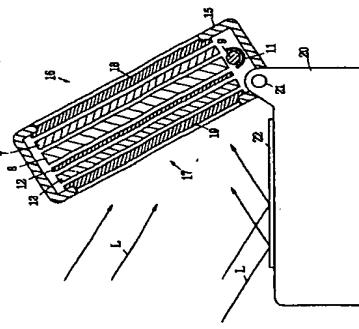


(4)

【図1】



【図2】



【図3】

